EXHIBIT B

I found the following references in the TS2-2003 and TS1-1989 specifications to pedestrian timings, outputs, and monitoring.

Section 4.1.1 of the TS2-2003 specification pertaining to conflict determination specifically states "For the purpose of conflict determination, a signal on any of the **Green**, **Yellow**, or **Walk** inputs associated with a channel shall be considered as that channel being active." Similarly, Section 6.1 of the TS-1-1989 specification pertaining to conflict determination specifically states "For purpose of conflict determination, a signal on any of the GREEN, YELLOW, or WALK inputs associated with a channel shall be considered as that channel being in service."
My Flashing Don't Walk Monitoring feature adds monitoring the Don't Walk input, when it is flashing, to the Green, Yellow, and Walk inputs when checking for active channels for the purpose of conflict determination.

TS2-2003

3.4.2.3.2 Load Switch Driver Condition

Means shall be provided, for user definition, of the output condition (**Green**, **Yellow**, or **Red**) of each Vehicle Load Switch Driver Group for each interval. A circuit closure to **Logic Ground** shall be maintained at one of these three outputs at all times. The three outputs shall energize the appropriate vehicle signal load switching circuit to result in a **Green**, **Yellow**, or **Red** indication for the duration of such required indication.

Means shall be provided, for user definition, of the output condition (**Walk**, **Pedestrian Clear**, or **Don't Walk**) of each Pedestrian Load Switch Drivers Group for each interval. A circuit closure to **Logic Ground** shall be maintained on at least one of these three outputs at all times. The three outputs shall energize the appropriate pedestrian signal load switching circuit to result in a **Walk**, **Pedestrian Clearance**, or **Don't Walk** indication. The **Don't Walk** output shall flash only during the **Pedestrian Clearance** interval(s).

3.4.5.3 Outputs

7. **Load Switch Drivers, Pedestrian** (Three Per Group)—Provision of separate **Walk**, **Pedestrian Clearance**, and **Don't Walk** outputs for each pedestrian movement. The three outputs shall energize the appropriate pedestrian signal load switching circuit to result in a **Walk**, **Pedestrian Clearance**, or **Don't Walk** indication. The **Don't Walk** output shall flash only during the **Pedestrian Clearance** interval as shown in Figure 3-12.

3.5.3.2 Phase Intervals

2. **Pedestrian Timing, Concurrent**
Concurrent pedestrian timing shall be permitted in association with any mode of vehicle signal timing. Two time settings shall be required:

a. **Walk**—This shall control the amount of time the **Walk** indication shall be displayed.
b. **Pedestrian Clearance**—This shall control the duration of the **Pedestrian Clearance** output and the flashing period of the **Don't Walk** output.

When a pedestrian call is stored in pedestrian memory and pedestrian indications are concurrent with an associated vehicle phase, the pedestrian sequence shall commence service when

entering the vehicle **Green** of that phase unless the **Pedestrian Omit** line is activated. During the display of the **Walk** and **Pedestrian Clearance** indications, a concurrent **Green** vehicle indication shall be shown. It shall be possible to recycle the pedestrian indications in response to succeeding pedestrian calls for service subject to absence of serviceable conflicting calls (vehicle or pedestrian) and non-activation of the **Pedestrian Omit** line.

3.5.3.12 Outputs

2. **Load Switch Drivers, Pedestrian** (Three Per Phase)—Provision of separate **Walk, Pedestrian Clearance**, and **Don't Walk** outputs for each pedestrian movement. A circuit closure to **Logic Ground** shall be maintained on at least one of these three outputs at all times. The three outputs shall energize the appropriate pedestrian signal load switching circuit to result in a **Walk, Pedestrian Clearance**, or **Don't Walk** indication. The **Don't Walk** output shall flash only during the **Pedestrian Clearance** interval as shown in Figure 3-12.

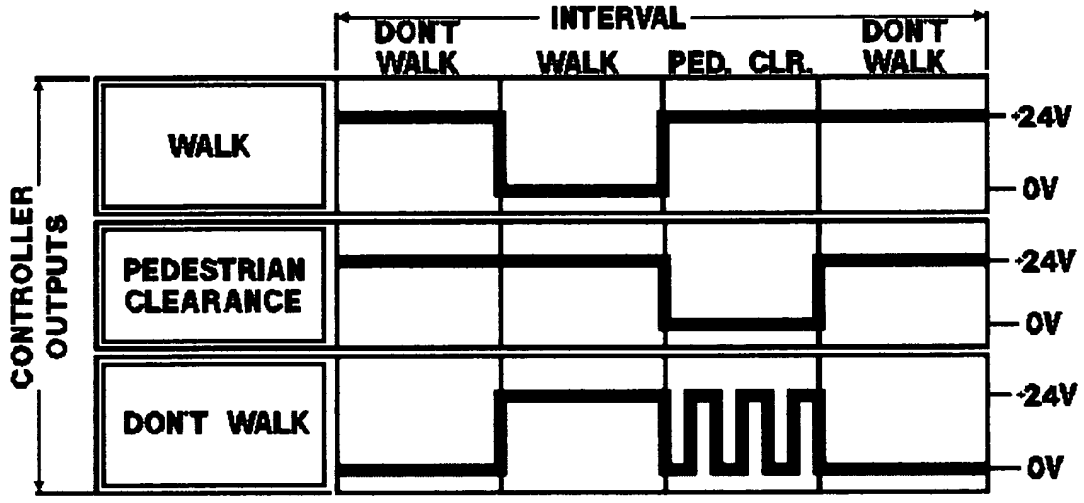

Figure 3-12
LOAD SWITCH DRIVERS, PEDESTRIAN

The **Don't Walk** flashing shall provide an alternating **True/False** output at 1 pulse per second repetition rate with 50 + 2 percent duty cycle.

4.1.1 Basic Capability

The **Signal Monitor** portion of the MMU shall be capable of monitoring for the presence of voltage on conflicting field connection terminals in the CA. For the purpose of conflict determination, a signal on any of the **Green**, **Yellow**, or **Walk** inputs associated with a channel shall be considered as that channel being active.

The **Signal Monitor** portion of the MMU shall also detect the absence of any required signal voltage on each channel at the field connection terminals in the CA. For this purpose a signal on the **Green**, **Yellow**, **Walk**, or **Red/Don't Walk** inputs associated with a channel shall be considered as that channel being active.

4.4.3 Conflict Monitoring

When voltages on any conflicting channels are detected as concurrently active for less than 200 milliseconds, the MMU shall not transfer the **Output** relay contacts to the fault condition. When voltages on any conflicting channels are detected as concurrently active for 450 milliseconds or more, the MMU shall transfer the **Output** relay contacts to the fault condition. When voltages on any conflicting channels are detected as concurrently active for more than 200 milliseconds but less than 450 milliseconds, the MMU may or may not transfer the **Output** relay contacts to the fault condition. The time interval between the beginning of the concurrently conflicting channels and the transfer of the **Output** relay contacts to the fault condition shall not exceed 450 milliseconds. A status bit shall be set in the Type 129 Frame (3.3.1.4) and transmitted to the CU through Port 1.

When the MMU transfers the **Output** relay contacts to the fault condition it shall cause continuity between the open (see 4.3.2.2) and common contacts of the **Output** relay. These contacts shall remain in this fault condition until the unit is reset by the activation of a front panel control or the activation of the **Reset** input.

An MMU **Power Failure** shall not reset the MMU when it has been triggered by a conflict prior to the MMU **Power Failure**.

TS1-1989

6.1 Basic Capability (NEMA Standard 5-15-1978)

The SIGNAL MONITOR portion of the CONFLICT MONITOR shall be capable of monitoring conflicting signal indications at the field connection terminals in the controller assembly. For purpose of conflict determination, a signal on any of the GREEN, YELLOW, or WALK inputs associated with a channel shall be considered as that channel being in service.

It shall also detect the absence of any required RED signal voltage at the field connection terminals in the controller assembly. For this purpose a signal on any of the GREEN, YELLOW, WALK, or RED inputs associated with a channel shall be considered as that channel being in service.

6.11 Sensing of Traffic Signal Displays (NEMA Standard 5-15-1978)

Four inputs shall be provided for each channel to permit the monitoring of voltages at vehicle GREEN, YELLOW, RED, and WALK signal field terminals. The unit shall be designed so that it shall not be necessary to terminate unused GREEN and YELLOW AND WALK signal sensing inputs when the impedance to AC+ of each of these inputs is less than the equivalent of 1500 picofarads (pf) between the lead and AC+ as measured at the input of the unit.

6.12 Conflict Monitoring (NEMA Standard 5-15-1978)

When voltages on any conflicting channels are present concurrently for 450 milliseconds or more, the CONFLICT MONITOR shall trigger. When two signals in conflict with one another are sensed concurrently for less than 200 milliseconds, the CONFLICT MONITOR shall not trigger.

Signals in conflict sensed for 200 milliseconds or more but less than 450 milliseconds may or may not cause the CONFLICT MONITOR to trigger (Authorized Engineering Information 4-7-1983)

When the CONFLICT MONITOR triggers, it shall cause two sets of isolated Form C relay contacts on the OUTPUT relay within the unit to transfer, and these contacts shall remain in this state until the unit is reset by the activation of a front panel control or the activation of the RESET input.

Power interruption shall not reset the CONFLICT MONITOR when it has been triggered by a conflict prior to the power interruption.

Background on Signal Monitoring units

Movement of both vehicle and pedestrian traffic at an intersection is handled in the same way. There is an active interval of time (a green indication for vehicles and a walk indication for pedestrians), a clearance interval of time (a yellow indication for vehicles and a flashing don't walk indication for pedestrians), and an inactive interval of time (a red indication for vehicles and a solid don't walk indication for pedestrians).

Pedestrian indications and their intended definitions:

WALK – A pedestrian may begin to cross the street in the direction of the WALK indication.

FLASHING DON'T WALK – A pedestrian should not begin to cross the street. Any pedestrian already in the street should continue to cross as the pedestrian clearance interval is calculated to allow a pedestrian that just stepped off the curb to safely cross the street.

SOLID DON'T WALK – A pedestrian should not be in the street.

There are four major signal monitoring functions that are performed at an intersection:

CONFLICTING INDICATIONS – The GREEN, YELLOW, and WALK indications are monitored to ensure that assignment of right-of-way at the intersection does not occur simultaneously for conflicting movements of traffic. Typically, indications that conflict for less than 200 milliseconds shall not cause a CONFLICT fault. Indications that conflict for more than 400 milliseconds shall cause a CONFLICT fault.

NO INDICATIONS – The GREEN, YELLOW, and RED indications for each vehicle movement and the WALK and DON'T WALK indications at the intersection are monitored to ensure that at least one of the indications for each movement is active. Typically, movements where all indications are inactive for less than 700 milliseconds shall not cause a NO INDICATION fault. Movements where all indications are inactive for more than 1000 milliseconds shall cause a NO INDICATION fault.

MULTIPLE INDICATIONS – The GREEN, YELLOW, and RED indications for each vehicle movement and the WALK and DON'T WALK indications at the intersection are monitored to ensure that no more than one indication to a movement of traffic is active at a time. Typically, movements where more than one indication is active for less than 300 milliseconds shall not cause a MULTIPLE INDICATION fault. Movements where more than one indication is active for more than 500 milliseconds shall cause a MULTIPLE INDICATION fault.

SEQUENCE – The GREEN, YELLOW, and RED indications for each movement are monitored to ensure that once a GREEN has been displayed that when it is turned off, it must be followed by a YELLOW and this YELLOW must last at least 2.7 seconds.

Comparison of Flashing Green and Flashing Don't Walk Detection and Implementation

Flashing Green Detection - The purpose of Flashing Green Detection is to ensure that greens that flash are sensed as being active even during their off time while flashing. There are two reasons that the green needs to be sensed as on while flashing. First, if two conflicting greens were flashing at the same time but one is on while the other is off (180 degrees out of phase) the two greens may not be seen as being on at the same time and therefore the conflict may not be detected. Second, when a green turns off, it is supposed to be followed by a yellow. But if the green is flashing, it will not normally be followed a yellow when it turns off. So the sequence test

must be modified to not require a yellow to start immediately after the green terminates. The sequence test will now wait for a period of time that guarantees that the green is no longer flashing and is in fact off. In general, the modifications needed to deal with a flashing green all revolve around how to deal with the off time when the indication is flashing. The function of the green within the four major monitoring functions does not change.

Flashing Don't Walk Detection - The purpose of my Flashing Don't Walk detection invention is to ensure that a pedestrian clearance interval (flashing don't walk) does not conflict with any other movement at the intersection. The Don't Walk indication is unique at an intersection in that it is the only indication with a dual purpose. When flashing, it indicates that the traffic controller is timing the pedestrian clearance interval, an interval during which it is safe for a pedestrian to be in the crosswalk. When solid, it indicates that it is not safe for the pedestrian to be in the crosswalk. So when the indication is flashing, it needs to be included in the conflict test. When it is solid, it is removed from the conflict test, as is normal.

So, the flashing green requires no rule changes within the monitor, just timing modifications. Where as my flashing don't walk invention requires that the rules for identifying a conflict change to include the don't walk indication only if it is flashing.

Also, the method in which the two indications are tested for flashing is different. The flashing green can flash at several different flash rates, usually faster than the one flash per second of the flashing don't walk indication.